MESOZOIC INSECTS OF QUEENSLAND.

No. 9. Orthoptera, and Additions to the Protorthoptera, Odonata, Hemiptera and Planipennia.

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(Plates li.-liii.; Text-figs. 72-89.)

[Read 25th October, 1922.]

The present paper completes the study of the Ipswich Upper Triassic fossils sent to me by Mr. B. Dunstan, Chief Government Geologist of Queensland, with the sole exception of the Coleoptera, which Mr. Dunstan himself is dealing with. In it no less than twenty species are dealt with, of which sixteen are described as new, while ten new genera are proposed for their reception. The species dealt with belong to the Orders Protorthoptera, Orthoptera, Odonata, Hemiptera (both Homoptera and Heteroptera) and Neuroptera Planipennia. A number of the fossils are shown enlarged on Plates li.-liii., which have been reproduced from photographs taken by Mr. W. C. Davies, Curator of the Cawthron Institute, to whom my best thanks are due. I also desire to thank Mr. F. Muir, the well known Homopterist of Honolulu, for valuable criticisms of my former publications on fossil Homoptera, as a result of which I have attempted some regrouping of the families represented in the Upper Trias.

Order **PROTORTHOPTERA.**

Family MESORTHOPTERIDAE.

Mesorthopteron locustoides, Tillyard, Mesozoic and Tertiary Insects of Queensland and N.S.W., Queensland Geol. Survey, Publ. No. 253, 1916, p. 14, Plate 2, figs. 3—6.

The types of this species are Specimens No. *5a* and *5b* in the Queensland Geol. Survey Collection at Brisbane. The fragment *5c*, though originally figured (*l.c.,* Plate 1, fig. 4) as belonging to this species, can now be proved not to belong to it at all. The wing shown on Plate 1, fig. 5 of the same paper (Specimen No. 4), which was originally indicated as doubtfully belonging to this species, has now been shown, by further study and comparison with other fossils, to be the somewhat badly preserved tegmen of a Homopteron, *Mesocixiodes brachyclada,* n.sp., described in this paper.

Since the type was described, a number of fragments of this species have been discovered at Ipswich, together with one more complete specimen showing a large portion of the wing. Taken together, they enable us to complete the restoration of the wing, the only parts not found upon one or other of the fragments being a portion of the distal area below the apex, together with the apical border itself, part of the distal branching of the cubitus, and the actual outline of the anal border. A study of all the specimens discovered shows that the original interpretation of the venation given by me was incorrect. A new definition of the family and genus is here given:—

Family *Mesorthopteridae*: Large Protorthopterous insects having rather long wings, well rounded at the apex, and carrying numerous main veins separated everywhere by a complete archedictyon or original meshwork of irregular polygonal cellules, as shown in Plate li., fig. 26. Costal space with many oblique veinlets. Sc a strongly formed vein. R strongly formed, with the origin of Rs placed far from base. M a weak vein fused with R basally and diverging only slightly from it. Cu_1 a very strongly formed vein, giving off a series of numerous anterior branches. Anal area rather narrow.

Genus MESORTHOPTERON Till. (Plate li., fig. 26; Text-fig. 72.)

Large insects having the forewing somewhat longer and narrower than the hind. Sc long, reaching to about one-fifth from apex, and with the subcostal veinlets evenly spaced and mostly unbranched. R_1 branching apically so as to fill the space between end of Sc and apex of wing. Rs with few branches, all running to margin around apex. M_{1+2} with few branches, M_{3+4} a weak furrow vein without any branches at all. Main stem of Cu_1 giving off anteriorly a series of about six anterior branches, very regularly arranged, most of which fork dichotomically before reaching the margin; the branches of this vein supply a space reaching from just below the apex right round to half-way along the posterior margin. Cu_2 a weak, straight, furrow vein, ending up somewhat before half-way along the posterior margin. Apparently only two anal veins, the first running parallel to Cu_2 just below it, and probably branched distally, the second somewhat curved, with a number of descending branchlets. In the costal and anal areas the archedictyon is much denser than on the rest of the wing, being formed of a very large number of very irregular cellules; in the rest of the wing, it consists chiefly of two rows of polygonal cells lying between each consecutive pair of longitudinal veins.

Genotype, *Mesorthopteron locustoides* Till.

The genus remains monotypic, and can be recognised at once by the extraordinary manner of branching of Cu_1, which, as far as I know, is unique within the Class Insecta. Small fragments of the wings of this insect are frequently met with at Ipswich, and can always be recognised by the very characteristic archedictyon.

MESORTHOPTERON LOCUSTOIDES Till. (Plate li., fig. 26; Text-fig. 72.)

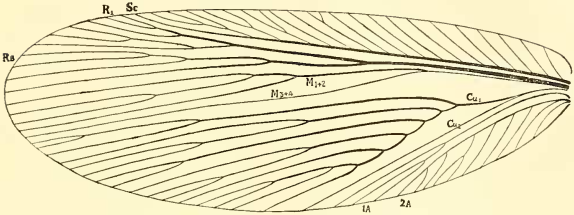
The restoration of this fine wing, given in Text-fig. 72, is based chiefly upon Specimen No. 258*b*, a large fragment of a forewing, showing almost the whole of the costal margin (except the apical and basal portions), and portions of all the veins down to within a short distance of the posterior margin; the latter, together with the anal area, is absent. *Total length* of fragment, 22.5 mm., from which the measurements of the complete forewing may be estimated to be about 35 mm. long by 15 mm. wide.

The other fragments studied in making the restoration were the following:—

Specimen No. 72 *a-b*: a small piece, showing portion of the anal veins and Cu_2.

Specimen No. 75: a fragment showing basal portions of Cu_1, Cu_2 and nearly all the anal veins.

Specimen No. 78*a-b*: portions of Cu_1 and Cu_2, showing branches of the former.



Text-fig. 72.—*Mesorthopteron locustoides* Till. Restoration of forewing, with archedictyon omitted (*see* Plate li., fig. 26.) (x 4).

Specimen No. 123: anal veins, basal part of Cu_2 and portion of branches of Cu_1.

Specimen No. 224: two fragments on one small piece of rock; one shows a piece of Sc with costal area, the other portions of the branches of Cu_1.

Specimen No. 234: ends of Sc and R, with branches around apex.

Specimen No. 241*b*: Sc and the costal area practically complete from base to near apex, also distal portion of R.

Type, Specimens No. 5*a*, 5*b*, in Coll. Queensland Geol. Survey, Brisbane. Heautotypes used in restoring the wing are the specimens mentioned above.

This insect is clearly an archaic type persisting from the Upper Carboniferous Protorthoptera, and appears to have its nearest relatives in the Prototettigidae of the Middle Upper Carboniferous of Saarbrücken.

Specimens No. 100 and 162*a* are fragments of Protorthopterous wings not belonging to the genus *Mesorthopteron*, and distinguished from it by the fainter and more regular archedictyon and the very strong veins. They probably belong to the genus *Notoblattites* Till., but there is not enough of the wing preserved to allow of a definite placing and naming of the specimens.

Order **ORTHOPTERA**.

Family TRIASSOMANTIDAE, n.fam.

Insects of rather small size, in which the forewing is of the general plan shown in recent Mantidae, but with the venation of a more archaic type. Sc short, ending up little beyond half-way along the costa, and thus leaving a long pterostigmatic area between itself and R_1. Rs arising nearer to base than in any known Mantoid types, and dividing dichotomically into two parallel branches. M a single vein to beyond middle of wing, dividing into two main branches beyond the level of the end of Sc. (Clavus and most of Cu missing).

This family appears to come fairly close to the Liassic Geinitziidae of Europe, but is more archaic in possessing a much longer Rs, which is dichotomically forked. The small bark-haunting Perlamantinae, well represented in Australia to-day, are perhaps the direct descendants of this family.

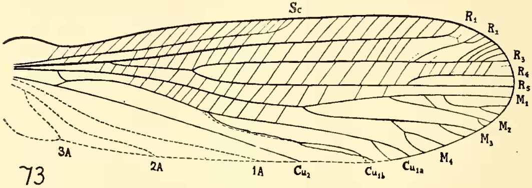
Genus TRIASSOMANTIS, n.g. (Plate li., fig. 27; Text-fig. 73.)

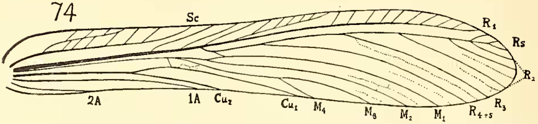
Characters as given for the family, with the following additions:—Costal and pterostigmatic veinlets, and all series of cross-veins, fairly abundant, oblique and parallel to one another. Sc and R_1 both turn fairly sharply upwards to end on the costal margin. R_{2+3} runs quite straight to a point a little above the apex, and gives off a strong anterior distal branch (R_2) below the end of R_1, together with a set of shorter distal branchlets anteriorly at the end of R_3. R_{4+5} also runs quite straight below and parallel to R_{2+3}, and gives off R_4 as a close parallel branch above R_5; the latter continues the line of R_{4+5} and ends up at the apex of the wing, which is well rounded. M slightly curved downwards near middle of wing; both its main branches give off somewhat irregular posterior branches with small terminal forks. Part of Cu_1 preserved distally as a straight vein having a small terminal fork.

Genotype, *Triassomantis pygmaeus*, n.sp. (Upper Triassic, Ipswich, Q.).

TRIASSOMANTIS PYGMAEUS, n.sp. (Plate li., fig. 27; Text-fig. 73.)

This species is represented by a rather faint impression of a left forewing, complete except for the loss of the clavus and most of the cubitus. *Total length,*





Text-fig. 73.—*Triassomantis pygmaeus*, n.g. et sp. Restoration of forewing with apex to right (*see* Plate li., fig. 27.) (x 11).

Text-fig. 74.—*Triassolocusta leptoptera*, n.g. et sp. Restoration of forewing (*see* Plate li., fig. 28.) (x 5.4).

10 mm. *Greatest breadth,* 2.8 mm. The costal veinlets are numerous and more closely spaced than the cross-veins in the rest of the wing. The elongated pterostigma carries eleven veinlets spaced about the same distance apart as the cross-

veins in the radial and median areas below them. The number and position of the terminal branches of Rs and M may also be considered as specific characters; R_3 has four closely placed anterior branchlets, while M_{1+2} and M_{3+4} both run straight to the wing margin, giving off only posterior branches as shown in Text-fig. 73. M_{1+2} converges towards R_5 from below.

Type, Specimen No. 86*a*, in Coll. Geol. Survey, Brisbane.

Horizon, Upper Triassic, Ipswich, Q.

The size of this wing appears to indicate a small insect, not unlike the present day Perlamantinae, and possibly of somewhat similar habits. The restoration of the missing parts of the wing, in Text-fig. 73, is made on the supposition that the missing portion of the venation was on the Perlamantine plan.

Family LOCUSTOPSIDAE.

This family was formed by Handlirsch to include a number of Liassic and Upper Jurassic Locustoid insects allied to the Elcanidae, but differing from them in having M branched instead of simple, Sc much longer, and Cu not fused basally with M. The fossil from the Upper Trias of Ipswich, which I here place under this family, agrees with the Locustopsidae in all characters except only the short Sc, a character which I do not consider of sufficient importance to justify the making of a new family to contain it. The definition of the family Locustopsidae will therefore need emending as regards the length of Sc, which may be either short or long. These insects appear to have been slender, voiceless Locustoids, having very long and slender antennae, and with the long, slender hind-legs not armed with spines.

Genus TRIASSOLOCUSTA, n.g. (Plate li., fig. 28; Text-fig. 74.)

Insects of moderate size, with forewing very long and narrow. Sc ending up before half-way along costal margin, and provided with a shorter anterior branch. Rs arising somewhat before half-way along the wing, with four distinct and well-spaced branches arranged in pectinate series. M branching into three near level of origin of Rs; the most posterior of these three branches, M_{3+4}, forks again distally. First fork of Cu placed well away from base, at about one-fourth of the wing-length. Cu_1 arching somewhat flatly upwards, connected with M above by an oblique vein (M_5), and forked distally. Cu_2 short, straight, ending up very close to Cu_{1b}. (Clavus missing).

Genotype, *Triassolocusta leptoptera*, n.sp. (Upper Triassic, Ipswich).

TRIASSOLOCUSTA LEPTOPTERA, n.sp. (Plate li., fig. 28; Text-fig. 74.)

Total length, 21 mm., *greatest breadth* (at about one-fifth from apex), 4 mm. The specimen is a very clear impression of a right forewing, complete except for the loss of the very narrow clavus and slight damage to the basal portion of the costal margin. Veinlets and cross-veins are only faintly preserved, and are mostly omitted from Text-fig. 74. Sc gives off an anterior branch Sc_1, quite close to the base; this branch has about four faint oblique cross-veins below it, and is separated from the end of the main stem of Sc by two oblique veinlets. From a little before the level of the end of Sc, R begins to give off anterior veinlets running very obliquely to the costal margin. There are three of these, the last being at the level of the origin of Rs. Next comes a fairly long anterior branch, running at a very slight angle to R_1 itself, and carrying on it four or five shorter anterior veinlets. Beyond this branch lies a series of pterostigmatic veinlets, eight in number, less obliquely placed. R_1 itself ends up not much before the apex of the wing. Rs has, besides the series of four pectinate branches already mentioned in the generic definition, a set of four terminal twigs arranged as shown in Text-fig. 74; the branch next below these ends exactly at the apex of the wing. The cross-venation in the spaces between the branches of Rs and M distally is a fine polygonal meshwork, two cells thick within each successive space, the borders of the cells making a slightly irregular line, dividing each space longitudinally about midway. Portions of these are indicated by dotted lines in Text-fig. 74.

Type, Specimen No. 99, in Coll. Queensland Geol. Survey.

Horizon, Upper Triassic, Ipswich, Q.

In Text-fig. 74, the clavus has been restored on the lines shown in the genus *Locustopsis* Handl., with only two anal veins.

Order **ODONATA**.

Suborder **Archizygoptera.**

Family MESOPHLEBIIDAE.

Further study of the genus *Mesophlebia* (Tillyard, 1916, p. 24) has convinced me that it does not belong to the Anisoptera, but to Handlirsch's Suborder Anisozygoptera, to which also most of the known Liassic Dragonflies belong. It seems best to treat it for the present as representative of a new family Mesophlebiidae, which shows some affinity with the Liassic Heterophlebiidae. The exact relationships of the new family cannot be accurately determined until the basal half of the wing is discovered.

MESOPHLEBIA ANTINODALIS Till. (Plate lii., fig. 30; Text-fig. 75.)

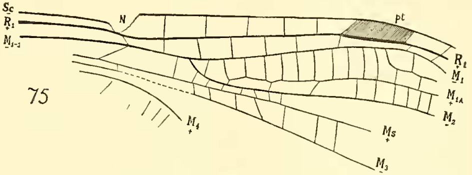
Tillyard, Mesozoic and Tertiary Insects of Queensland and New South Wales, Qld. Geol. Survey, Publ. No. 253, 1916, p. 24.

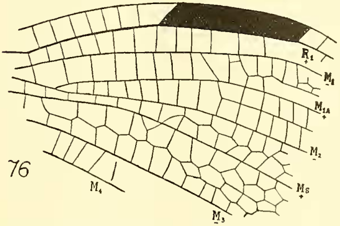
Specimen 127*a* represents a fairly well preserved portion of a right forewing of this species, comprising the whole of the costal margin from somewhat before the nodus to a little beyond the pterostigma, and including the subnodus and all branches of M except M_4, of which only a very small portion is preserved. The nodus is incomplete basally by the loss of the costal margin, though Sc is complete. The pterostigma is complete and remarkably well preserved.

Total length of fragment, 28 mm. *Distance from nodus to beginning of pterostigma,* 12 mm. *Length of pterostigma,* 3.6 mm. The approximate total length of the wing must have been about 40 mm. By comparison with the type specimen, the present wing is found to be somewhat narrower in comparison with its length, and may therefore be considered as a forewing, the type specimen representing a hindwing. The pterostigma, however, is longer than in the type (3.6 mm. as against 2.8 mm.) which is a somewhat anomalous condition. *Number of postnodals* five, as in type. *Pterostigma* slightly wider basally than distally, slightly shorter along costa than along R, and strongly thickened along R. No brace-vein below pterostigma. A strong, oblique subnodus between R and M_{1+2}, strutted below, between M_{1+2} and Ms, by a much longer oblique cross-vein running in the opposite direction, at right angles to subnodus. M_1 curving upwards so as to come to lie close under pterostigma, as in the type. Structure of M_{1A} and M_2 very closely similar to type, but the broadened space between M_1 and M_{1A} below distal half of pterostigma carried definitely two rows of cellules. A weak oblique vein indicated between M_2 and Ms, far from level of nodus, and a similar but longer oblique vein below it, between Ms and M_3.

Distad from level of nodus, M_4 arches rather sharply downwards away from M_3, as also in type.

The differences to be noted between the new specimen and the type consist in the presence of a definite subnodus normally placed, the absence of the weak pterostigmatic brace-vein shown in the type, the longer pterostigma, and the double row of cellules distally below the pterostigma. As the type was not very well preserved in places, it is possible that these differences may not really have been as great as they appear, e.g., the apparent brace-vein in the type may be only very slightly different from the normal cross-vein of the present specimen,





Text-fig. 75.—*Mesophlebia antinodalis* Till. Heautotype. (*see* Plate lii., fig. 30.) (x 3.5). Convex veins marked +, concave veins —.

Text-fig. 76.—*Triassophlebia stigmatica*, n.g. et sp. Fragment of wing. (x 5). Convex veins marked +, concave veins —.

while the subnodus may be present in the type, but indistinct, and the same may be true of the double row of cellules below the pterostigma. I have therefore decided not to give the new fossil a separate specific name, but to include it in the species *M. antinodalis* Till., allowing a certain amount of variability in the length of the pterostigma in this species, and in one or two other characters. It is a great pity that this second fossil shows practically the same portions of the wing preserved as in the type, while the important region of arculus and discoidal cell still remains undiscovered.

Type, Specimen No. 3*a*, and Type-Counterpart Spec. No. 3*b*. Heautotype, Specimen No. 127*a*. All in Coll. Queensland Geol. Survey, Brisbane.

Genus TRIASSOPHLEBIA, n.g. (Text-fig. 76.)

Pterostigma elongated, about twice as long as in *Mesophlebia*. *Postnodals* numerous and close together. M_1 only slightly converging towards R beneath distal end of pterostigma. M_{1A} and M_2 very much as in *Mesophlebia*, but M_{1A} definitely arising from M_2. Supplementary sectors present distally between M_1 and M_{1A}, also between M_{1A} and M_2. Ms running very close below M_2 at level of origin of M_{1A}, as in *Mesophlebia*, but no oblique vein visible between M_2 and Ms. Two rows of cellules present distally between M_2 and Ms. M_3 lies further away from Ms than in *Mesophlebia*, with two rows of cellules between them at the level of the origin of M_{1A}, increasing to three and then to four rows distally. M_4 not arching strongly downwards away from M_3. (Rest of wing not preserved).

Genotype, *Triassophlebia stigmatica*, n.sp. (Upper Triassic, Ipswich, Q.).

This new genus may be placed provisionally within the Mesophlebiidae, pending the discovery of more complete material.

TRIASSOPHLEBIA STIGMATICA, n.sp. (Text-fig. 76.)

Total length of fragment, about 14 mm., probably representing a total wing-length of at least 40 mm. *Number of postnodals* preserved or partially preserved, eight, indicating a total of about twelve. *Pterostigma* covering about nine or ten cellules. R somewhat thickened below pterostigma, but not so strongly as in *Mesophlebia antinodalis*. M_{1A} arises from M_2 as a well defined vein, strongly convex, well before the level of the pterostigma, and continues strongly to below the middle of the latter, when it becomes slightly kinked in one or two places, as shown in Text-fig. 76. Supplementary sector above M_{1A} preceded by three irregularly divided cellules; that below M_{1A} is a straight sector from its very beginning, preceded by a single row of cellules. M_2 arising from M as a strongly diverging vein which almost at once approaches Ms very closely, being separated from it only by a single row of very narrow cellules; further distad, below the level of the pterostigma, these two veins diverge somewhat, and are separated by two rows of cellules. The portion of M_3 preserved runs sub-parallel to Ms, and is separated from it mostly by two rows of cellules, increasing to three or four rows of smaller cellules distally. Only a small portion of M_4 is preserved, diverging slightly from M_3, and separated from it by a single row of cellules.

Type, Specimen No. 82*a* in Coll. Queensland Geological Survey, Brisbane.

Horizon, Upper Triassic, Ipswich, Q.

Suborder **Anisozygoptera.**

Family TRIASSAGRIONIDAE, n.fam.

Sc greatly shortened, ending up at less than one-fourth of the wing-length. Probably only two antenodals present. No definite nodus formed. Postnodals numerous. A true pterostigma present. Base of wing petiolate, very narrow. M fused with R basally, diverging very gently from it at the arculus, which is incomplete posteriorly. No true discoidal cell present. At the arculus M divides into $M_{1\text{-}3}$ and M_4; the former is a strong concave vein, running below and sub-parallel to R_1, and giving off (*a*) the common stem of M_3 and Ms, and (*b*) at about twice as far from the arculus, the stem of M_2. M_2 arises from M_1 a little before half-way along the wing, arching strongly downwards, and soon dividing into two strong branches, which diverge at a sharp angle; the upper branch, M_{2a}, runs straight along the wing to end up just below the apex, close to M_1A, which is a long sector formed between M_1 and M_2; the lower branch, M_{2b}, runs obliquely just above Ms. The common stem of Ms and M_3 soon divides at a very acute angle into Ms, which runs straight on, obliquely across the wing, and M_3, which arches so as to end up about half-way along the posterior border, far from Ms, but very close to M_4. M_4 is a slightly arched, unbranched, convex vein, rather weakly formed distally. The cubitus is a simple, concave vein, corresponding with Cu_1 of recent Odonata, slightly curved below the arculus, and then running almost straight on to end up at about the middle of the posterior border, a little before M_4. Anal crossing present as a weak cubito-anal veinlet, situated at the end of the petiole, and marking the origin of 1A from Cu; 1A itself runs between Cu and the posterior border, and ends up not far from Cu. Both Cu and 1A become weak and somewhat zig-zagged distally.

Handlirsch formed the new Suborder Archizygoptera to include the single peculiar and highly problematical genus *Protomyrmeleon* Geinitz, represented by a single species, *P. brunonis* Geinitz, from the Upper Lias of Dobbertin in Mecklenburg. This fossil was placed by him in the family Protomyrmeleontidae, the only family of the Suborder. The present fossil agrees with *Protomyrmeleon* in the very striking characters of the shortened Sc, unformed nodus, peculiar development of M_1A, two-branched M_2 and simple cubitus, but appears to differ in the base not being petiolate, M arising separate from R, so that no arculus is formed, separation of the base of Ms from M_3, and entire absence of 1A. (It should be noted that Handlirsch's naming of all the veins after M_1 is incorrect, his M_2 being actually M_1A; his Rs, M_{2a}; his M_3, M_{2b}; his M_4, Ms; and his Cu_1, Cu_2 and 1A being M_3, M_4 and Cu respectively). It would appear highly probable that the true base of *Protomyrmeleon* has not been preserved, including the petiole (if present), the portion of M fused with R, and the true arculus. This misled Handlirsch in naming the veins. As drawn by him in Plate xlii., fig. 14 of his Atlas to "Die Fossilen Insekten," there is, in any case, no true 1A in this genus.

Genus TRIASSAGRION, n.g. (Plate lii., fig. 31; Text-fig. 77.)

To the characters given for the family we may add the following for the genus:—*Postnodals* about twenty-four, the basal ones mostly continuous with the cross-veins below them, the distal ones not so. *Pterostigma* short, about twice as long as wide. R_1, M_1, M_1A and M_{2a} all ending up close together at or near apex of wing. M_1A arises as a weak zig-zag vein from near base of M_2, and runs very close above M_2 at first, but gradually diverges until, below the pterostigma, it runs as a straight vein about half-way between M_1 and M_{2a}. The wide triangular spaces between the two branches of M_2 and also between Ms and M_3 are filled with irregular cellules, without any supplements. Only one row of cellules between 1A and the posterior border of the wing.

Genotype, *Triassagrion australiense*, n.sp. (Upper Triassic, Ipswich, Q.).

It is useless to try to compare this genus closely with any existing Zygoptera, owing to the great difference in the structure of the arculus, the entire absence of the discoidal cell, the primitive condition of Cu and 1A, and the branched condition of M_2. I would, however, call attention to certain resemblances which it bears to the forewing of the genus *Chorismagrion* Morton. This latter genus, found in North Queensland at the present day, has the arculus open basally in the forewing; Sc is very short; M_{1-3} gives off the common stem of M_3 and Ms at the subnodus, and M_2 far beyond it, with M_{1A} forming a well developed vein between M_1 and M_2; Cu, except for current usage, might well be interpreted as a simple vein, 1A arising separately out of the posterior margin just beyond the end of the petiole, and connected with Cu above it by the anal crossing. Again, if we look at the genus *Hemiphlebia,* which also has the arculus incomplete basally in the forewing, we see that the same interpretation of Cu and 1A is the obvious one, and that 1A actually arises from the cubito-anal veinlet as it does in *Triassagrion,* with a small cross-vein connecting it with the end of the petiole as in that genus. This latter character, being unique in present-day Zygoptera, is a very significant one. I therefore suggest the *probability* of our modern Zygoptera having arisen from some such form as *Triassagrion* by the following changes:—

(1) Formation of a complete nodus by strengthening of the subnodal cross-veins between end of Sc and R, and between R and M_{1-3}.

(2) Formation of the strong distal side of the still open discoidal cell, by change of direction of the first cross-vein between M_4 and Cu.

(3) A further bending of Cu below arculus, correlated with (2).

(4) Cross-vein situated below distal angle of discoidal cell becomes strong and oblique, and, in the nymphal wing, carries a trachea which captures 1A and attaches it to Cu.

(5) Shortening and simplification of M_{1A}.

(6) Reduction of M_2 to a simple vein.

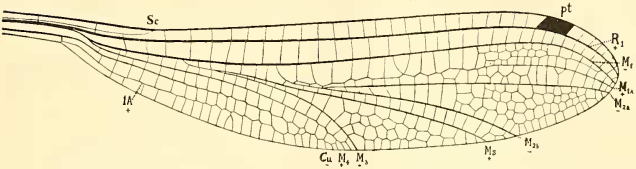
(7) Approximation of M_3 towards Ms.

Definite proof of the origin of modern Zygoptera from such a type as *Triassagrion* cannot be given with the present state of our knowledge. It is more probable that a considerable number of archaic types ancestral to various groups of the true Zygoptera were already in existence in the Upper Trias. One, indeed, we already know in the genus *Triassolestes,* related to *Epiophlebia.* We can only add that the recent studies of Professor C. H. Kennedy on the penes of Zygoptera strongly indicate the probability of forms such as *Hemiphlebia* and the Megapodagrionidae being the oldest existing Zygoptera, and that this result, startling as it appears to be, would be quite in harmony with the evidence of our Upper Triassic fossils.

TRIASSAGRION AUSTRALIENSE, n.sp. (Plate lii., fig. 31; Text-fig. 77.)

An almost complete wing, probably a forewing. *Total length,* 21 mm; *Greatest breadth,* 4.5 mm. The wing is the reverse of a left wing, as is shown by R_1 being concave and M_1 convex in the impression.

The wing is complete except for the following missing parts:—Portions of the costal area broken away (*a*) before the end of Sc, (*b*) in two places between Sc and pterostigma, the second of these being a deep triangular break reaching across R_1, as shown in Plate lii., fig. 31, and (*c*) from pterostigma to near apex; in this last case, the two posterior angles of the pterostigma are visible, and also the whole of the straight and slightly thickened base along R_1, so that the stigma itself can easily be restored in its entirety. The basal piece of Cu up to beginning of arculus is very faintly preserved, and has been restored backwards to base, in Text-fig. 77, along the line faintly indicated in the fossil. The posterior margin of the petiole is absent, but a clear indication of the cubito-anal crossing and the beginning of 1A below it can be seen; most of the course of 1A is very faint indeed. Between the origins of M_3 and M_2, the wing has become slightly buckled by lying above a hard, convex object, probably a fruit or cone of some plant, and this has also caused the transverse tear, which can be seen across veins M_4 and Cu_1 in Plate lii., fig. 31, somewhat anterior to this point, and is indicated by the dark shadow. The distal halves of M_4 and Cu_1 are thus shifted upwards out of their proper levels, and at the same time



Text-fig. 77.—*Triassagrion australiense*, n.g. et sp.. Restoration of wing. (*see* Plate lii., fig. 31.) (x 6.3). Convex veins marked +, concave veins —.

it is probable that, by slight longitudinal rucking, the veins M_3, Ms and M_2 have got pushed together more closely, near their origins, than would be the case if the wing were lying flat. The correct positions of these last three veins cannot be exactly restored; but, in the case of M_4 and Cu, the former being convex and the latter concave, it is easy to pick up their broken courses, and to restore them as in Text-fig. 77.

Plate lii., fig. 31 shows this fossil wing with the light so arranged that the main veins are well shown up; consequently, the cross-veins are not well shown, being mostly at right angles to the main veins. Under a moderate power, however, every single cross-vein of this wing can be seen, though they are all of very fine calibre. The only parts which cannot be restored with absolute certainty are those where there has been a break or rucking. In this connection, I desire to emphasize the following points:—

(1) In the restoration, the origins and basal portions of M_3, Ms and M_2 are probably crowded a little too closely together, owing to the rucking already mentioned.

(2) It is not absolutely certain that there are only two antenodals; there may be another one closer to the distal end of Sc.

(3) Cu, being a concave vein, is raised up in this reverse impression, and its basal piece, within the petiole, has the actual impression of the vein removed, as often along a ridge; its course, however, seems fairly well indicated, and it is restored in its normal position for Zygoptera.

(4) The posterior border of the petiole is also missing. But the anal crossing, Ac, can be seen, with faint indications of the origin of 1A below it. The restoration is given in the only possible way in which these remnants can be made to fit into the wing-scheme, but must not be taken as being absolutely accurate.

(5) The breaks along the costa have been filled in by completing the series of postnodals, and by continuing the oblique sides of the pterostigma upwards from the preserved posterior portion along R_1. As this vein can be seen to be strongly thickened below the pterostigma, the assumption that the latter was well chitinised is, I think, justified.

The importance of this wing in the study of Odonate phylogeny seems to me to be so great that it is essential that all doubtful points in the restoration of the wing should be fully emphasized.

Type, Specimen 290*a* (reverse), in Coll. Queensland Geol. Survey, Brisbane.

Horizon, Upper Triassic, Ipswich, Q.

Order **HEMIPTERA.**

Suborder **Homoptera.**

Since the publication of Nos. 7 and 8 of this series of papers, a considerable number of tegmina have been sent to me from the Ipswich fossil beds. It is now apparent that, next to the Coleoptera, the Homoptera were the dominant Order in the Upper Trias of Ipswich. We now know enough to attempt a review of the whole position of the Suborder at that period; the difficulty is not so much lack of knowledge of the Triassic forms, as the still fluctuating and uncertain schemes of classification of recent Auchenorrhyncha, particularly in the Superfamily Fulgoroidea. Mr. F. Muir, the well-known authority on these insects, has recently taken considerable interest in the fossil discoveries at Belmont and Ipswich; and he writes to me that, in his opinion, the Suborder Palaeohemiptera of Handlirsch does not exist, as the two genera still included in it (*Prosbole* Handl. and *Mitchelloneura* Till.) may reasonably be considered as archaic Fulgoroids of the family Tropiduchidae, the connection being furnished by the evidence of the venation of the South American genus *Alcestis.* Accepting this view, it becomes evident at once that the tegmina placed in this paper under the genus *Mesodiphthera* are even more typically Tropiduchid than those already mentioned. I therefore have no hesitation in removing them from the Scytinopteridae and placing them in the Tropiduchidae. Mr. Muir is also of opinion that the forms placed by me in the subfamily Mesocixiinae of the Scytinopteridae are true Cixiidae, a conclusion which seems reasonable when we consider that this family stands morphologically at the very root of the Fulgoroidea. I shall therefore remove the genera *Mesocixius* Till., *Triassocixius* Till. and *Mesocixiodes,* n.g. to the family Cixiidae. The Ipsviciidae may also be considered to be a specialised family of Fulgoroidea, and are almost the only Triassic forms in which the evolution of the anal Y-vein on the clavus can be seen to have begun.

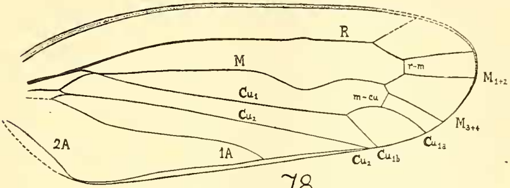
This leaves in the Scytinopteridae the Upper Triassic genera *Mesoscytina* Till., *Triassoscarta* Till. and *Chiliocycla* Till. To these will be here added the two new genera *Apheloscyta* and *Polycytella,* the former allied to *Scytinoptera* Handl. and the latter to *Chiliocycla.* It is possible that the two genera *Chiliocycla* and *Polycytella* may prove to be Membracids of a primitive type; but until we can discover the clavus of *Chiliocycla,* so as to determine the course of 1A, it will be best to leave them in the Scytinopteridae.

The other families of Auchenorrhyncha represented in the Upper Triassic of Ipswich are the Mesogereonidae, ancestral to the Cicadidae, and the Cicadellidae or Jassidae. No further examples of these are dealt with in this paper.

Family SCYTINOPTERIDAE.

Genus Apheloscyta, n.g. (Plate liii., fig. 33; Text-fig. 78.)

Allied to *Scytinoptera* Handl. from the Upper Permian of Russia, but differing from it in having Rs coming off from R quite close to the apex of the wing, whereas Rs arises about half-way along R in *Scytinoptera.* Vein M, which is quite straight in *Scytinoptera*, is bent sharply into a very noticeable bay or hollow, concave to the costal margin, a little beyond the middle of the wing, in the new genus. Terminal branchings of M and Cu_1 two each, connected by a single cross-vein much as in *Scytinoptera*, but M_{3+4} and Cu_{1a} lie closer together. Clavus (missing in *Scytinoptera*) of fairly typical Scytinopterid type, but 2A



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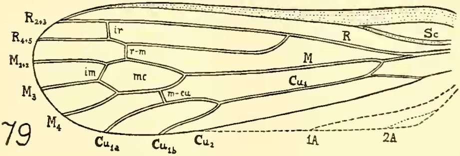

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Text-fig. 78.—*Apheloscyta mesocampta*, n.g. et sp. Tegmen. (*see* Plate liii., fig. 33.) (x 10.3).

Text-fig. 79.—*Chiliocycla scolopoides* Till. Restoration of tegmen from type and heautotype, with tuberculation omitted. (x 11.7). (*see* Plate liii., fig. 37.)

lies very close to the basal posterior margin, and appears also to run close alongside the distal posterior margin of the clavus, thus showing a very early stage in the evolution of the true claval Y-vein found in the Fulgoroidea. Shape of wing somewhat different from that of *Scytinoptera*, the costal area being about equally wide throughout, and the apex much less broadly rounded.

Genotype, *Apheloscyta mesocampta*, n.sp. (Upper Triassic, Ipswich).

APHELOSCYTA MESOCAMPTA, n.sp. (Plate liii., fig. 33; Text-fig. 78.)

Total length, 10 mm.; *greatest breadth*, 3.5 mm.

A complete tegmen, except for slight damage at the base of the clavus and also at end of R_1; of tough consistency, strongly granulated all over. All the main veins clearly marked, but the distal branchings somewhat fainter. The impression is that of a left tegmen, of which both obverse and reverse are preserved; the latter is the better impression of the two.

T y p e, Specimen No. 98*a* (reverse) in Coll. Queensland Geol. Survey, Brisbane.

H o r i z o n, Upper Triassic, Ipswich, Q.

Genus CHILIOCYCLA Till.

Tillyard, Proc. Linn. Soc. N.S.W., xliv., pt. 4, 1919 (1920), p. 868.

G e n o t y p e, *Chiliocycla scolopoides* Till. (*l.c.*, p. 869).

CHILIOCYCLA SCOLOPOIDES Till. (Plate liii., fig. 37; Text-fig. 79.)

Specimen No. 327*a* is a second example of this interesting tegmen, more complete basally than the type, but with the clavus missing, and the sculpture much more poorly preserved. Combining the two tegmina, it is possible to offer a reconstruction of the tegmen as shown in Text-fig. 79, the very strong sculpture of flat circular tubercles, covering all except the distal end of the tegmen, being omitted. The new specimen shows very clearly the excessively strongly built costal border basally, and the short Sc connecting with it. The restoration of the clavus is purely provisional.

T y p e s: Holotype, Specimen No. 158*a*; heautotype, Spec. No. 327*a*, in Coll. Queensland Geol. Survey, Brisbane.

H o r i z o n, Upper Triassic, Ipswich, Q.

Genus POLYCYTELLA, n.g. (Plate liii., fig. 36.)

Tegmen of rather long, narrow shape, strongly sculptured all over with a meshwork of raised polygonal cellules, somewhat resembling the flattened tubercles of *Chiliocycla*, but placed more closely together. Only four main veins between the costa and the vena dividens, viz., Sc, R, M and Cu_1. These radiate out from near the base of the wing, and run almost straight to the wing-margin, without any branches. Sc very short; R ends up about half-way along the curved costal margin, M near apex, and Cu_1 well below apex. Cu_2 (vena dividens) runs straight to a little beyond half-way along posterior margin of wing. Clavus (partially missing) apparently rather narrow, the courses of the anal veins not preserved.

G e n o t y p e, *Polycytella triassica*, n.sp. (Upper Triassic, Ipswich).

POLYCYTELLA TRIASSICA, n.sp. (Plate liii., fig. 36.)

Total length of fragment, 7.5 mm., representing a tegmen of about 8.5 mm. in length. The costal margin is not very well preserved, except at the extreme base, where there may also be seen a short, slender vein, probably a much shortened Sc, separated from the costa by a single row of cellules. Between Sc and R there are three rows of cellules, somewhat irregularly arranged. The number of rows of cellules between R, M, Cu_1 and Cu_2, respectively, increases in each case from the base outwards from one or two up to six or seven rows, and the individual cellules become somewhat larger distally. The distal two-fifths of the costa and the whole of the apical margin to a little below the end of Cu_1 are missing, as is also most of the clavus.

T y p e, Specimen No. 81*a*, and paratype No. 154 (poorly preserved), in Coll. Queensland Geol. Survey, Brisbane.

H o r i z o n, Upper Triassic, Ipswich, Q.

Family TROPIDUCHIDAE.

Genus MESODIPHTHERA Till. (Text-figs. 80, 81.)

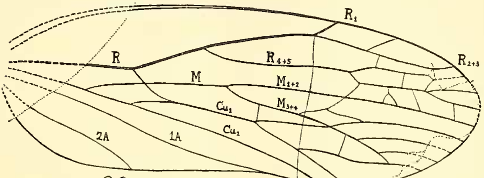
Tillyard, Proc. Linn. Soc. N.S.W., xliv., pt. 4, 1919 (1920), p. 873.

The type of this genus is *M. grandis* Till., represented by the basal half only of a large tegmen about 20 mm. long. Two more specimens referable to this genus are now to hand, and enable us to add to the definition of the genus the following characters:—Branches of R and M irregularly branched distally; a slightly impressed dividing line crossing the wing transversely from near end of R_1 to near end of clavus.

MESODIPHTHERA PROSBOLOIDES, n.sp. (Text-fig. 80.)

Greatest length of fragment, 14.4 mm; *greatest breadth,* 5 mm. The complete tegmen was probably about 15 mm. long.

This species is represented by the greater portion of a fairly large tegmen, evidently of stout build, but not very well preserved. The membrane is creased and cracked in places, making it very difficult to follow out the details of the venation, in which there are some very unexpected fusions of branch veins. The



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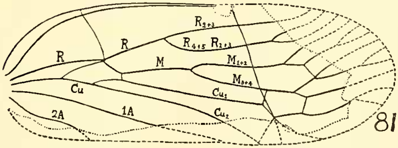

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Text-fig. 80.—*Mesodiphthera prosboloides*, n. sp. Tegmen restored. (x 7.5).
Text-fig. 81.—*Mesodiphthera dunstani*, n. sp. Tegmen restored. (x 11.6).

structure of the basal half of the tegmen resembles that of *M. grandis* Till., except that there is an oblique connecting vein between M and Cu_1, absent in the genotype, and Cu_1 is weakly formed and somewhat irregular. The costal area is broad basally, and shaped as in the genotype. R_1 appears as a short free vein distally, arising obliquely from R_{2+3}, which is not well preserved. R_{4+5} is considerably branched. M_{1+2} is a strong, straight vein running to near apex, and having no branches. M_{3+4} gives off three anterior branches distally, and also meets two very oblique branches from Cu_1, the main stem of which is short, and ends up not far beyond the end of the clavus. Cu_2 is a straight furrow-vein. Most of the clavus is preserved, with 1A and 2A separate, and shaped much as in the genotype, though 2A is longer. The border of the clavus seems to be somewhat irregular in shape, but is not well preserved, and may have undergone some distortion.

Type, Specimen No. 89*a*, in Coll. Queensland Geol. Survey, Brisbane.

Horizon, Upper Triassic, Ipswich, Q.

MESODIPHTHERA DUNSTANI, n.sp. (Text-fig. 81.)

Greatest length of fragment, 10.8 mm.; *greatest breadth,* 3.8 mm. The complete tegmen was probably about 12 mm. long.

This species is complete basally, except for a small portion of the border of the clavus; the apical portion of the tegmen is broken off obliquely, but all the main branchings of the veins are well shown, though a considerable amount of transverse crumpling undergone by the tegmen makes them difficult to follow in places. The species is easily distinguished by the basal bending of M, which arches up so as to touch R, and then bends downwards again until it nearly touches Cu. Also all the distal branchings of R and M tend to turn upwards, and both branches of M are forked. Cu_1 is weakly formed, as in the previous species, but its manner of branching is different.

Family CIXIIDAE.

Genus MESOCIXIODES, n.g. (Plate liii., fig. 34; Text-figs. 82-84.)

Allied to *Mesocixius* Till., and also to *Triassocixius* Till., but differing from both in having R_1 unbranched, while R_{2+3} sends a series of veinlets to the costa distally. Costal area very broad. Median cell (*mc*) complete, small, and placed far distally, as in *Mesocixius.* Cu_1 with a small distal fork.

Genotype, *Mesocixiodes termioneura,* n.sp. (Upper Triassic, Ipswich, Q.).

MESOCIXIODES TERMIONEURA, n.sp. (Plate liii., fig. 34; Text-fig. 82.)

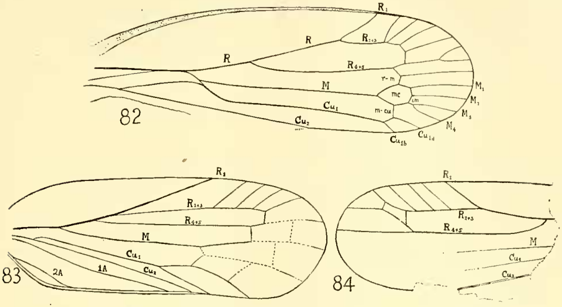
Total length, 12.5 mm.; width at end of clavus, 3.5 mm. The tegmen is complete except for the absence of the clavus and a slight break near the apex of the wing; it is finely granulated all over, and is stained a bright orange-brown. R_1 is a short vein, slightly curved, and somewhat similar to the terminal branches of R_{2+3}, though more strongly formed. R_{2+3} gives off altogether four terminal branches, the first two of which arise close together. R_{4+5} branches into two distally, the upper branch having a short terminal fork. R_{2+3} and R_{4+5} are connected distally by a strong cross-vein, and a similar cross-vein, *r-m,* connects R_{4+5} with the closed median cell below it. M_1 and M_2 are sessile upon the median cell (*mc*), M_3 and M_4 shortly stalked from it. A strong cross-vein, *m-cu,* connects the median cell with the short Cu_{1a} below it. There are no cross-veins present in the broad costal area, nor in the spaces between the main veins, except the three distal ones already mentioned, together with *im,* which closes the median cell.

Type, Specimen 88*a*, in Coll. Queensland Geol. Survey, Brisbane.

Horizon, Upper Triassic, Ipswich, Q.

MESOCIXIODES ORTHOCLADA, n.sp. (Text-fig. 83.)

Total length, 9 mm.; *greatest breadth,* 3.2 mm. This specimen is complete, except for partial obliteration of the distal portion. The costal area is broad, as in the genotype, but R_1 is a much longer vein, running straight out from the main stem of R in an oblique direction to a point about three-fifths of the way



Text-fig. 82.—*Mesocixiodes termioneura*, n.g. et sp. Tegmen. (*see* Plate liii., fig. 34.) (x 6.7).

Text-fig. 83.—*Mesocixiodes orthoclada*, n.g. et sp. Tegmen. (x 8).

Text-fig. 84.—*Mesocixiodes brachyclada*, n.g. et sp. Fragment of tegmen. (x 5).

along the costa, and thus making the costal area very pointed distally. Four evenly-spaced branches of R_{2+3} are present, and this vein leaves the main stem of R very close to R_{4+5}. M does not appear to be connected with Cu_1 basally, and its distal branches are very indistinct, though the median cell appears to be an elongated cell enclosed between only two main branches. The distal forking of Cu_1 is much longer than in the genotype. Clavus complete, with 1A running below and close to Cu_2 and very slightly waved; 2A a small loop across the anal angle.

T y p e, Specimen No. 318*a,* in Coll. Queensland Geol. Survey, Brisbane.

H o r i z o n, Upper Triassic, Ipswich, Q.

In the absence of any definite evidence as to the true form of the median cell, it seems best to keep this species in the genus *Mesocixiodes,* with which it agrees in its other characters. The species is easily distinguished by the striking form of R_1, which has suggested the specific name *orthoclada.*

MESOCIXIODES BRACHYCLADA, n.sp. (Text-fig. 84.)

This species is represented only by the distal half of a left tegmen of about the same size as that of the previous species, having the four distal branches of

R_{2+3} similarly situated, but the first of them much closer to R_1, which is a short vein like that in the genotype, but quite straight. The end branch of R_{2+3} is gently curved, and is joined to an anterior branch of R_{4+5} by two short cross-veins. R_{2+3} and R_{4+5} come off far apart, as in the genotype. Branches of M and Cu_1 obliterated; Cu_2 apparently a rather stout vein. Length of fragment, 9.5 mm.

Type, Specimen No. 325*a* in Coll. Queensland Geol. Survey, Brisbane. Specimen No. 4, figured by me in 1916 (*l.c.*, Plate 1, fig. 5) as doubtfully belonging to *Mesorthopteron locustoides* Till., belongs to this species also, but the venation is very poorly preserved.

Horizon, Upper Triassic, Ipswich, Q.

Family IPSVICIIDAE.

Genus Ipsviciopsis, n.g. (Plate liii., fig. 35; Text-figs. 85, 86.)

Closely allied to *Ipsvicia* Till. from the same horizon, but differing from it in having an anterior branch of R present, which I have labelled R_1 in the figures, though it may perhaps represent R_{2+3} with R_1 suppressed. The tegmen is also of more normal shape, with a less acute apex and much less prominent anal angle of the clavus. Distally R and M are irregularly branched. Cu_1 is curved as in *Ipsvicia*, but runs much closer to Cu_2. The claval Y-vein is present, but its stem and the distal portion of its posterior arm (2A) are scarcely removed at all from the border of the wing. There are no patches of raised tubercles present, but the tegmen is finely and evenly granulated all over.

Genotype, *Ipsviciopsis elegans*, n.sp. (Upper Triassic, Ipswich, Q.).

Ipsviciopsis elegans, n.sp. (Plate liii., fig. 35; Text-fig. 85.)

Total length, 12.5 mm.; *greatest breadth*, 3.8 mm. The specimen is a practically complete left tegmen, obverse impression, which has been turned round in Text-fig. 85, so as to bring the apex to the right. A small piece at the base of the costa has become somewhat detached from the rest of the wing, as may be seen in Plate liii., fig. 35, but has been replaced in Text-fig. 85. There is also some slight abrasion of the angle of the clavus. Rs and M are connected distally by three cross-veins, enclosing between them two elongated polygonal cells; above these is another cell formed by the branching of Rs distally, and closed by another cross-vein. Small branches from Rs and M form a series of irregular and mostly very small cells along the apical margin. M_{3+4} unites with Cu_1, which is unbranched, thus leaving a large open space below M_{1+2}. The whole tegmen is stained a rich orange-brown.

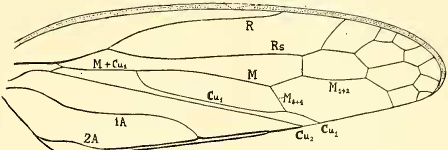
The above description applies to Specimen No. 178*a*, which is the type. Specimen No. 278*a* is another practically complete tegmen of this same species. It is the obverse of a right tegmen, complete except for an oblique depression in the rock, which runs across the distal portion of the wing, and has caused some abrasion in the depressed portion. The venation is almost exactly the same as in the type, there being only some slight differences in the size and position of the distal cells.

Types, Holotype, Specimen No. 178*a*; paratype, Specimen No. 278*a*. Both in Coll. Queensland Geol. Survey, Brisbane.

Horizon, Upper Triassic, Ipswich, Q.

IPSVICIOPSIS MAGNA, n.sp. (Text-fig. 86.)

This species is represented by a fragment of a right tegmen, reverse impression, measuring 10 mm. in length, and obviously belonging to a large tegmen, probably about 26 mm. in total length. It is very much cracked and



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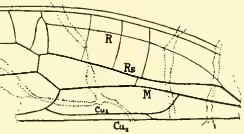


Text-fig. 85.—*Ipsviciopsis elegans*, n.g. et sp. Type tegmen restored, with apex to right. (*see* Plate liii., fig. 35.) (x 7.9).

Text-fig. 86.—*Ipsviciopsis magna*, n.g. et sp. Fragment of tegmen. (x 6).

broken transversely, possibly owing to its toughness and may have been cracked under pressure. It differs markedly from the previous species in possessing a series of transverse veinlets running from Rs across R_1 to the costa. R_1 ends up on the fourth of these, which is joined near the costa by the fifth, these two arising one on each side of the strong cross-vein connecting Rs with M. A sixth veinlet is shown distally from Rs to the costal margin. R is also connected more basally with M by a short cross-vein, absent in the previous species; and a small cross-vein, obliquely placed, connects Cu_1 with Cu_2 at about the same level. Clavus and distal portion of the wing missing, as well as the extreme base.

T y p e, Specimen No. 93*a*, in Coll. Queensland Geol. Survey, Brisbane.

H o r i z o n, Upper Triassic, Ipswich, Q.

Suborder **Heteroptera**.

Division *GYMNOCERATA*.

Family DUNSTANIIDAE.

Specimen 119*a* is a hemelytron belonging to this family, probably to *Dunstaniopsis triassica* Till., but not well enough preserved for accurate determination. The greater portion of the corium is visible, with the stems and branches of M and Cu, but all the margins are destroyed. The clavus and membrane are mostly obliterated.

Division *CRYPTOCERATA.*

Family TRIASSOCORIDAE, n.fam.

Insects resembling the Naucoridae and Galgulidae in the form of the hemelytron, which is broad, with a strongly projecting clavus reaching half-way or less along the posterior margin, and strongly angulated. Tegmen smooth, dark and shiny, as in Naucoridae, and not tough or marked with paler patches as in Galgulidae; the main veins R, M and Cu_1 are still visible on the corium, which extends over the greater portion of the hemelytron and is separated from the narrow distal membrane by a definitely impressed line, more or less concentric with the wing-border. In the region of the membrane above the apex, R and M give off a series of radiating branches which cross the membrane at close and regular intervals; most of these are only faintly outlined. These characters agree with those of the Belostomatidae of the present day, from which the fossil family is distinguished by its much smaller size and different shape. It would appear to be ancestral to the three families Galgulidae, Naucoridae and Belostomatidae, and perhaps to all the rest of the Cryptocerata also.

Genus T r i a s s o c o r i s, n.g. (Text-figs. 87, 88.)

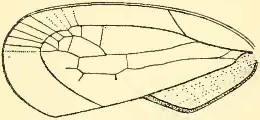
Hemelytron short, broad, quite smooth in texture, shiny and also very darkly coloured. Venation mostly very faintly marked, only three main veins apparent on the corium, viz., R, M and Cu_1. R and M are fused basally for some distance. R runs about parallel with the costal margin, a considerable distance from it; about one-third from base, it gives off a faint oblique veinlet, which is probably the first of the series of radiating veinlets continued around the apex, but mostly too weakly formed to be made out with certainty. M and Cu_1 both very faint, becoming irregular distally, and breaking up into small branchlets, most of which are too faint to be indicated accurately in the figure. Below Cu_1 there is an appearance of a very faint, irregular, polygonal meshwork; this is more clearly marked in specimen 167*b* than it is in specimen 140. The division between corium and membrane distally is indicated by a curved line running round from the end of R concentrically with the rounded apical margin. In the region of the apex, especially above it, a series of radiating veinlets can be seen crossing the membrane; they are clearly branches of R and M which cross the concentric line above mentioned. Clavus short and broad, strongly angulated, and ending up about half-way along the posterior margin of the wing, with which it makes a very marked angle. The position of the two hemelytra on the back of the insect when at rest is shown in Text-fig. 88, the shaded portions being the two clavi.

G e n o t y p e, *Triassocoris myersi*, n.sp. (Upper Triassic, Ipswich).

Triassocoris myersi, n.sp. (Text-figs. 87, 88.)

Total length, 5.8 mm.; *greatest breadth*, 2.5 mm. Hemelytron broad and well rounded apically; the corium and membrane quite smooth, apparently shiny in life, and probably of a very dark colour, since specimen 140 is very much darker than the rock on which it lies, but is clearly not carbonised. The venation of the corium is very faint, but the courses of M and Cu_1 upon it can just be made out in a strong oblique light, as well as a small portion of the polygonal meshwork, in specimen 140; in specimen 167*b*, this meshwork is more clearly marked, and very irregular in form.

This species is dedicated to my friend Mr. J. G. Myers, F.E.S., Assistant Entomologist, Biological Laboratory, Wellington, N.Z., who is doing excellent work on New Zealand Hemiptera.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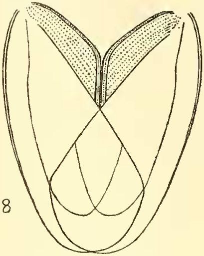
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Text-fig. 87.—*Triassocoris myersi*, n.g. et sp. Tegmen. (x 9.6).
Text-fig. 88.—*Triassocoris myersi*, n.g. et sp. The two tegmina placed in the position of rest. (x 9.6).

T y p e s, Specimen 140*a* (corium and membrane) and 167*b* (clavus), in Coll. Queensland Geol. Survey, Brisbane.
H o r i z o n, Upper Triassic, Ipswich, Q.

TRIASSOCORIS SCUTULUM, n.sp.

Specimen No. 134 contains two impressions of different insects, one being a portion of the tegmen of a Cockroach belonging to the genus *Samaroblatta* Till., not sufficiently well preserved to merit a name, and the other the two hemelytra of a species of *Triassocoris* folded over in the position of rest, as shown in Text-fig. 88, which was reconstructed from the previous species. The present species differs from the genotype in having the hemelytra much less rounded apically; so that, when folded in the position of rest, their appearance is more pointed apically, the figure being shield-shaped. Besides this, it can be seen that the course of R and the dividing vein which continues it between corium and membrane does not run concentrically with the margin but begins at the base comparatively close to the costa, and gradually diverges from it towards the apex. The hemelytra are irregularly broken off basally, but most of the two clavi can be seen *in situ*; the venation is practically obliterated.

T y p e, Specimen No. 134 in Coll. Queensland Geol. Survey, Brisbane.
H o r i z o n, Upper Triassic, Ipswich, Q.

Specimen No. 184*b* also appears to belong to this genus, but is too poorly preserved for description.

Order **NEUROPTERA**.

Suborder **Planipennia**.

Family PSYCHOPSIDAE.

Genus T R I A S S O P S Y C H O P S, n.g. (Plate lii., fig. 32; Text-fig. 89.)

Forewing very broad, the apex rounded, but less so than in most recent Psychopsidae, the tornus broadly rounded. Sc, R_1 and Rs very strongly built from base to a little beyond half-way, forming a true *vena triplica,* characteristic of this family, and joined distally by two strong cross-veins; beyond this point, these three veins continue a short distance, when they are again connected by two cross-veins; at this point, Sc divides into terminal veinlets; R_1 and Rs continue a little further, when they are again connected by a cross-vein, after which Rs divides into terminal veinlets; R_1 divides into such between the second and third cross-veins. Of the three veins forming the vena triplica, Sc is much the strongest, R_1 the weakest. Costal area broad, a little broader than the area covered by Cu and the anal veins, but not so broad as in recent forms; a recurrent veinlet present at its base, sending a number of branches to the margin; the succeeding costal veinlets lie close together, mostly arising from Sc at an angle of about 45°, mostly branched, and connected here and there by small cross-veins, which show no tendency to become arranged into a costal series of gradate cross-veins, such as occurs in many recent forms. Apical area missing in the fossil, but its extent can be inferred from the length of the pectinate branches of Rs, some of which are preserved right to the margin of the wing; the actual shape of the apex can also be inferred from the comparative width of the costal margin and slant of the costal veinlets. Rs with about fourteen branches descending from the vena triplica, some branched and some simple within the area of the disc, but all branching closely towards the distal margin of the wing. M apparently with five branches within the area of the disc, and connected with the lowest branch of Rs by a strong oblique cross-vein. No fusion of M with Cu_1 distally. Cu_1 strongly formed, remaining unbranched for about three-fifths of its length, and then giving off numerous branches to the area of the tornus. Cu_2 a weakly-formed vein lying closely parallel below Cu_1, giving off a series of branches from about half-way, and bending strongly down distally below the point where Cu_1 gives off its first branch. 1A and 2A slightly arched veins branching longitudinally; 3A not present as a vein distinct from 2A basally. Posterior margin of the wing not strongly arched outwards at base. Cross-veins present in the vena triplica, strongly formed, spaced irregularly at fairly wide intervals. Numerous weak cross-veins present in the disc, especially in the basal half and between the branches of M almost to the distal margin; there are also weak cross-veins present between most of the outer branches of Rs at about two-thirds of the wing-length from the base; these show a tendency to arrangement as a true gradate series separating the disc from the marginal area; the latter is practically devoid of cross-veins, the cubito-anal area completely so.

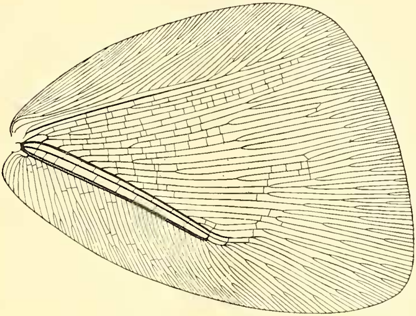
G e n o t y p e, *Triassopsychops superba,* n.sp. (Upper Triassic, Ipswich, Q.).

This genus differs from *Archepsychops* Till. in its less expanded costal area, in having R_1 and Rs separate right from the base, and not curved downwards markedly away from Sc, and also in having Cu_1 straight at the base, not arching sharply downwards, and making a smaller angle of divergence with Sc than in *Archepsychops.* This latter genus was placed by me, with *Protopsychopsis,* in the family Prohemerobiidae; but it seems probable, on the evidence offered by the new fossil, that it too would possess a true vena triplica of the Psychopsid type, and should therefore be placed within the family Psychopsidae. *Protopsychopsis* on the other hand must remain in the Prohemerobiidae, since the form of its apical area shows that a true vena triplica was not present.

The discovery of this magnificent fossil, complete in all the more important details of venation, enables us to state definitely that true Psychopsidae were present in the Upper Triassic fauna of Ipswich. The more primitive condition of the fossil wing, compared with recent forms, and especially noticeable in the less rounded apex, less expanded costal area, and absence of any definite or complete gradate series of cross-veins, makes it necessary to place *Triassopsychops* by itself in a new subfamily Triassopsychopinae, which may possibly also include the genus *Archepsychops,* when more of the venation of that genus is made known.

TRIASSOPSYCHOPS SUPERBA, n.sp. (Plate lii., fig. 32; Text-fig. 89.)

Greatest length of fragment (obliquely along lower branches of Rs), 29 mm., representing a total length of 32 mm. *Greatest breadth of fragment,* 22 mm., representing a true greatest breadth of the complete wing, near tornus, of about 23.5 mm. The fossil is beautifully preserved, but the apical portion of the wing



Text-fig. 89.—*Triassopsychops superba*, n.g. et sp. Restoration of forewing. (*see* Plate lii., fig. 32.) (x 3).

is missing, and there are also irregular breaks along the costal and posterior margins. The more important details of venation have been included in the generic definition; the lesser details of the branching of the veins may be gathered from Plate lii., fig. 32. Text-fig. 89 shows a restoration of the complete wing, based on the photograph shown in the Plate.

Type, Specimen No. 284*a,* in Coll. Queensland Geol. Survey, Brisbane.

Horizon, Upper Triassic, Ipswich, Q.

Order **COLEOPTERA**.

The numerous specimens belonging to this Order, chiefly separate elytra, but some few showing the body of the insect with the wings *in situ,* are being worked up by Mr. Dunstan, and will be dealt with in a separate part. There is, however, one specimen of great interest which may be dealt with here, since it does not require a name. It is Specimen No. 170, which shows the stem of a plant in which there can be plainly seen the mine or burrow of an insect larva. The type of burrow is clearly Coleopterous, and the larva probably belonged to one of the obscure families of very small beetles, the burrow being far too small to be that of a Cerambycid. It is shown in Plate li., fig. 29.

EXPLANATION OF PLATES LI.-LIII.

Plate li.

Fig. 26.—*Mesorthopteron locustoides* Till. Forewing, specimen No. 258*b*. (x 5).
Fig. 27 —*Triassomantis pygmaeus*, n.g. et sp. Forewing. (x 10.5).
Fig. 28.—*Triassolocusta leptoptera*, n.g. et sp. Forewing. (x 5.1).
Fig. 29.—Burrow of Coleopterous larva in stem of plant. (x 6.2).

Plate lii.

Fig. 30.—*Mesophlebia antinodalis* Till. Heautotype. (x 4).
Fig. 31.—*Triassagrion australiense*, n.g. et sp. (x 4).
Fig. 32.—*Triassopsychops superba*, n.g et sp. (x 4.2).

Plate liii.

Fig. 33.—*Apheloscyta mesocampta*, n.g. et sp. Tegmen. (x 8.85).
Fig. 34.—*Mesocixiodes termioneura*, n.g. et sp. Tegmen. (x 7.6).
Fig. 35.—*Ipsviciopsis elegans*, n.g. et sp. Tegmen. (x 7.5).
Fig. 36.—*Polycytella triassica*, n.g. et sp. Tegmen. (x 11).
Fig. 37.—*Chiliocycla scolopoides* Till. Tegmen. Type. (x 10).

(N.B.—The numbers of the figures run concurrently with those of the previous Part).